

# DESCRIPTION OF A NEW SPECIES OF CHIMAERID, *CHIMAERA BAHAMAENSIS* FROM THE BAHAMAS (HOLOCEPHALI: CHIMAERIDAE)

Jenny M. Kemper, David A. Ebert,  
Dominique A. Didier, and Leonard J. V. Compagno

## ABSTRACT

A new species of chimaera, *Chimaera bahamaensis* sp. nov., is described from a single specimen collected in Bahamian waters, east of Andros Island, in the western North Atlantic. The new species is only the fourth member of this genus known to occur in the Atlantic Ocean. It is distinguished from other Atlantic Ocean *Chimaera* species by a combination of morphometric characters and coloration including a relatively large body, long pre-narial length, short pectoral-pelvic space, long pelvic-caudal space, caudal ventral margin ending slightly posterior to caudal dorsal margin, and a uniform caramel brown coloration with dark brown fins. This new species is compared to *Chimaera monstrosa* Linnaeus, 1758, *Chimaera cubana* Howell-Rivero, 1936, and *Chimaera* cf. *monstrosa*, the only other species in the genus *Chimaera* known to occur in the Atlantic Ocean.

The chimaeras (Chondrichthyes: Holocephali) are a small, derived group of holocephalans located within the Class Chondrichthyes. The group consists of three families of which the Chimaeridae is the largest and includes two genera, the *Chimaera* with 11 described species and the *Hydrolagus* with 22 described species (Eschmeyer and Fricke, 2009; James et al., 2009). Morphologically the two genera are difficult to distinguish except by the presence (*Chimaera*) or absence (*Hydrolagus*) of an anal fin (Bigelow and Schroeder, 1953; Didier, 2004).

The *Chimaera* in the Atlantic Ocean presently has only three recognized species represented in this genus, *Chimaera monstrosa* Linnaeus, 1758, *Chimaera cubana* Howell-Rivero, 1936, and a new species *Chimaera* cf. *monstrosa* currently being described by the authors. *Chimaera monstrosa* is a wide ranging species in the eastern North Atlantic and Mediterranean Sea (Bigelow and Schroeder, 1953; Stehmann and Bürkel, 1984; Möller et al., 2004), and from a few scattered records obtained from video footage by Remote Operated Vehicles (ROV) in the western North Atlantic (Ross and Quattrini, 2007). The other two species each have a somewhat more restricted range as *C. cubana* occurs in the Caribbean Sea (Howell-Rivero, 1936; Bigelow and Schroeder, 1953), and *C. cf. monstrosa* occurs in the southeastern Atlantic off Namibia and South Africa (Compagno et al., 1989).

During the course of examining comparative western Atlantic *Chimaera* species material we found a specimen (FMNH 166362) labeled as *C. monstrosa* that was not that species and did not conform to any of the other known *Chimaera* species from this region. Upon further examination and comparison it was determined that this specimen from the Bahamas was in fact an undescribed *Chimaera* species. We herein describe this new species that represents only the fourth known member of the genus *Chimaera* from the Atlantic Ocean.

## METHODS

Morphological measurements follow Quaranta et al. (2006) as modified from Didier and Stehmann (1996). Lateral line canal measurements of the head follow Didier and Séret (2002). All measurements were taken point to point on preserved specimens. A total of 35 body measurements and 8 lateral line canal measurements were used. Acronyms and definitions are in the Appendix (p. 659).

Institutional abbreviations follow Leviton et al. (1985) and include the Florida Museum of Natural History (FMNH), South African Museum (SAM), South African Institute of Aquatic Biodiversity (SAIAB), U.S. National Museum of Natural History (USNM), Museum National d'Histoire Naturelle (MNHN), and Harvard University Museum of Comparative Zoology (MCZ), and personal field numbers for Leonard J.V. Compagno (LJVC).

*Chimaera bahamaensis* new species

(Bahamas ghost shark)

Figures 1, 2; Tables 1, 2

*Holotype*.—FMNH 166362, adult female, 881 mm total length, TL, 528 mm body length, BDL; Atlantic Ocean, Tongue of the Ocean, Bahamas, Andros Island (24°30'21"N, 77°22'12"W). Collected by Quinn et al., field number CI144, at 1483–1506 m on 3 February 1974.

*Diagnosis*.—A species assigned to the genus *Chimaera* based on the presence of an anal fin separate from the ventral caudal margin by a notch. *Chimaera bahamaensis* is distinguished from other *Chimaera* spp. by its relatively large body size, long pre-narial length, short pectoral-pelvic space, long pelvic-caudal space, ventral caudal margin ending slightly posterior to dorsal caudal margin, oral and preopercular lateral line canals sharing a short common branch, and a uniform caramel brown coloration with no color markings or mottling present, and all fins a slightly darker brown color.

*Description*.—Morphometric measurements, expressed as a proportion of BDL (%), of the holotype are presented in Table 1. A large bodied species with a large head (25.1% BDL), about 20.0% of precaudal length. Snout short, blunt, distance from snout tip to pre-narial 48.0% head length, HDL, snout tip to pre-oral 62.0% of HDL. Eyes relatively large, oval, about 27.6% HDL, eye height one-half of eye length. Trunk stout, body depth remains similar to origin of pelvic fins where it quickly tapers posteriorly, transitioning to a caudal filament. Pectoral-pelvic space short (23.4% BDL) and about 67.0% of trunk length. Pelvic-caudal space long (63.8% BDL) and about 51.0% of precaudal length. Skin is smooth, without denticles, non-deciduous. Post-anal pad is present.

First dorsal fin base short, 13.7% BDL, and preceded by a robust dorsal fin spine. Dorsal fin spine tall, anterior margin 23.1% BDL, greater than 90.0% of HDL and extending past apex of first dorsal fin. Spine is moderately curved with majority occurring near distal tip, free from the first dorsal fin for at least the distal one-half length of spine. Two columns of serrations present on posterior margin of spine, slight keel present along anterior margin. Dorsal fin spine, when depressed posteriorly, reaches to or past second dorsal fin origin. First dorsal fin triangular, anterior margin rela-

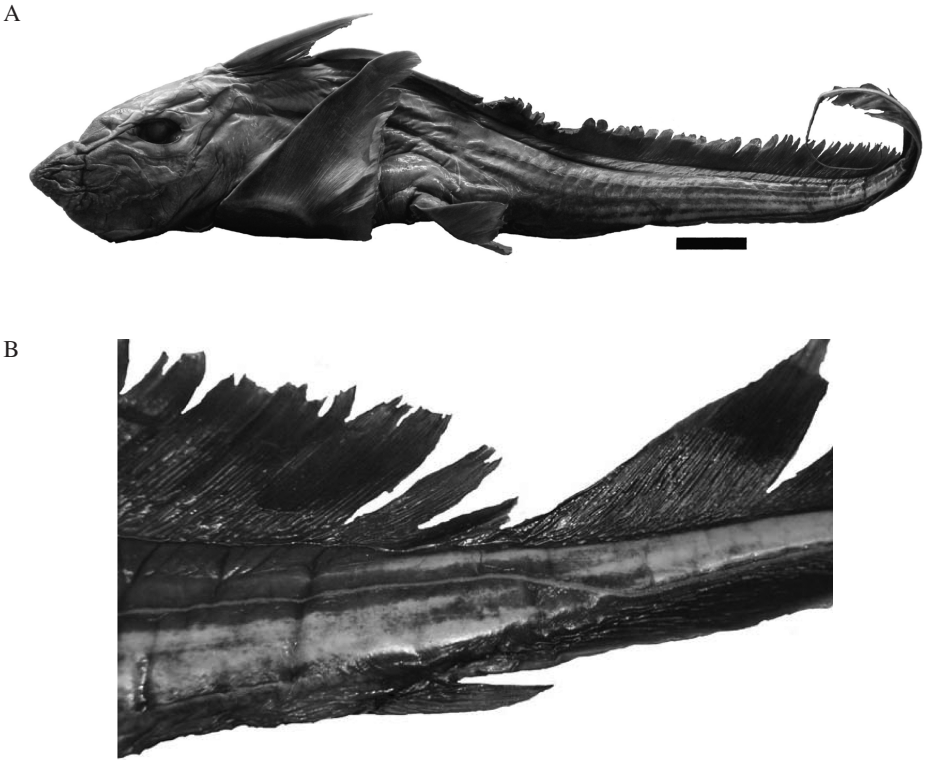


Figure 1. A-B: Preserved *Chimaera bahamaensis* sp. nov., holotype, FMNH 166362, adult female, 881 mm TL, 528 mm BDL. (A) Lateral view, scale bar represents 5 cm; (B) Lateral view of anal fin.

tively convex, posterior margin concave, height relatively short (14.4% BDL), about equal to pre-orbital length. Second dorsal fin base long (80.5% BDL), height relatively uniform throughout, but with posterior one-third of fin length with greatest height (5.4% BDL). Second dorsal fin height is < 65.0% of first dorsal fin height. Margin of second dorsal fin straight, not undulating, with posterior end of fin curving downwards to dorsal caudal fin origin.

Dorsal and ventral aspects of the caudal fin elongate, broad, transitioning into a whip-like tail filament. Ventral caudal lobe is about 13.0% greater in length than the dorsal caudal margin, with the ventral caudal insertion posterior to the dorsal caudal insertion. Both caudal fin lobes are about equal in height, height less than second dorsal fin height. Anal fin present (Fig. 1B), low, with a pointed tip, separated from ventral caudal fin by a notch. Anal fin originates below second dorsal fin with anal fin tip extending beyond insertion of second dorsal fin.

Pectoral fins large, broad and triangular (41.3% BDL), anterior margin mainly straight, slightly convex near highly rounded tip. Posterior margin relatively straight, becoming rounded near inner margin. When depressed, pectoral fin reaches beyond insertion of pelvic fin. Pelvic fins are large and broad, about 55.0% of pectoral fin length; anterior margin relatively straight to weakly convex becoming rounded at tip; posterior margin highly convex.

Table 1. Body length proportions (%BDL) of holotype *Chimaera bahamaensis* and comparative material. See Appendix I for morphological abbreviations.

	<i>C. bahamaensis</i>	<i>C. cf. monstrosa</i>	<i>C. monstrosa</i>	<i>C. cubana</i>
	Holotype	n = 5	n = 23	n = 13
	Adult female			
Measurement	%BDL	%BDL	%BDL	%BDL
TL	166.9	164.4–179.9	156.0–225.0	170.0–260.0
PCL	125.2	116.7–123.0	117.0–127.0	120.0–138.0
BDL	528 (mm)	489–534 (mm)	400–488 (mm)	109–427 (mm)
SVL	56.8	57.0–60.3	59.0–67.0	55.0–66.2
TRL	35.0	29.5–40.1	35.0–48.0	28.0–36.0
PD2	45.3	42.5–46.4	46.0–57.0	49.0–60.0
PD1	26.5	23.2–26.1	24.0–33.0	29.0–39.0
POB	14.3	10.3–11.8	7.0–15.0	10.9–16.0
POR	12.0	9.0–13.1	10.0–15.0	12.5
PRN	15.4	7.5–10.3	6.0–10.0	8.4
D2B	80.5	73.8–77.9	71.0–79.0	65.0–81.0
D2AH	5.0	2.8–6.7	3.0–5.0	4.0
D2PH	5.4	2.6–5.8	3.0–4.0	3.7
D1B	13.7	12.5–13.8	14.0–21.0	16.0–21.0
DSA	23.1	15.9–22.1	18.0–26.0	24.0–29.2
D1H	14.4	13.8–18.8	18.0–24.0	13.1–35.0
CDM	22.8	18.8–23.6	18.0–29.0	13.0–25.0
CDH	4.5	2.2–5.0	2.0–4.0	1.4
CTL	40.0	13.0–47.7	44.0–104.0	72.6
CVM	26.3	21.6–32.8	25.0–90.0	35.0–59.0
CVH	4.4	2.3–6.0	2.0–4.0	1.6
HDL	25.1	20.7–23.0	20.0–29.0	25.0–33.0
P1A	41.3	34.3–38.9	29.0–40.0	34.0–44.0
P2A	22.5	17.6–20.9	15.0–21.0	17.0–20.0
IDS	7.5	4.9–10.6	2.0–12.0	1.0–10.0
DCS	0.2	0.6–1.5	0–1.0	1.0–3.0
PPS	23.4	29.4–35.2	30.0–40.0	29.7
PAS	58.7	51.7–60.7	59.1	57.7
PCS	63.8	56.4	53.0–60.0	61.5
D1P1	21.8	12.8–17.5	18.0–22.0	19.6
D1P2	37.3	31.6–41.2	29.0–46.0	40.2
D2P1	30.3	23.6–29.5	27.0–41.0	31.4
D2P2	26.3	19–25.5	21.0–30.0	19.4
EYL	6.9	5.8–6.9	2.0–9.0	8.0–11.0
EYH	3.5	3.7–4.9	5.0–6.0	4.7–8.0

Lateral line canal measurements are presented in Table 2. Lateral lines of the head are open grooves. Oral and preopercular canals share a short common branch off the infraorbital canal (Fig. 2). Lateral line canal of trunk originates at a fork between occipital and otic canals with a sigmoid curve, and then with slight undulations, extends posteriorly to caudal region, where it becomes ventral and continues to caudal filament.

Table 2. Head length proportions (%HDL) of lateral line canals of the head of holotype and comparative material.

	<i>C. bahamaensis</i>	<i>C. cf. monstrosa</i>	<i>C. monstrosa</i>	<i>C. cubana</i>
	Holotype	n = 5	n = 22	n = 1
	Adult female			
Measurement	%HDL	%HDL	%HDL	%HDL
ONC	10.1	6.5–10.4	6.4–15.2	11.9
LRC	4.3	4.5–10.3	3.7–6.4	8.7
LNC	24.9	17.9–25.9	18.8–24.6	32.5
IOA	13.6	12.2–16.8	10.6–15	18.3
OTM	32.5	27.6–37.2	28.9–34.5	37.4
OCL	15.9	14.6–19.4	12.0–18.4	15.9
STL	18.6	13.1–20.6	13.7–18.8	23.6
SPS	14.1	6.5–14.8	16.1–28.3	20.1

**Coloration.**—Preserved specimen a solid, uniform caramel brown, with no mottling or spotting pattern present. All paired and unpaired fins a slightly darker caramel color. Dorsal spine coloration is beige.

**Etymology.**—The species name *bahamaensis* refers to the locality where the holotype was collected. The proposed common name “Bahamas ghost shark” is an allusion to its known occurrence.

**Distribution.**—The holotype of *C. bahamaensis* is presently the only known specimen of this species recorded to date, but it is likely wider ranging in the western Atlantic.

**Comparison.**—*Chimaera bahamaensis* is the fourth member of this genus now known to occur in the Atlantic Ocean and can be distinguished from its three congeners (*C. cubana*, *C. monstrosa*, and *C. cf. monstrosa*) by a combination of morphological and coloration differences.

*Chimaera bahamaensis* differs from *C. cubana* in having a larger body (528 vs 109–427 mm BDL), a shorter pre-second dorsal length (45.3% vs 49.0%–60.0% BDL), a shorter pre-first dorsal length (26.5% vs 29.0%–39.0% BDL), a shorter pre-oral length (12.0% vs 12.5% BDL), a longer pre-narial length (15.4% vs 8.4% BDL), a greater second dorsal anterior height (5.0% vs 4.0% BDL), a greater second dorsal posterior height (5.4% vs 3.7% BDL), a shorter first dorsal fin base (13.7% vs 16.0%–21.0% BDL), a shorter dorsal spine anterior margin (23.1% vs 24.0%–29.2% BDL), a greater caudal dorsal fin lobe height (4.5% vs. 1.4% BDL), a shorter caudal fin ventral margin (26.3% vs 35.0%–59.0% BDL), a greater caudal ventral fin lobe height (4.4% vs. 1.6% BDL), a longer pelvic fin anterior margin (22.5% vs 17.0%–20.0% BDL), a shorter pectoral-pelvic space (23.4% vs 29.7% BDL), a shorter horizontal eye diameter (6.9% vs 8.0%–11.0% BDL), and a shorter eye height (3.5% vs 4.7%–8.0% BDL). *Chimaera cubana* has a first dorsal fin that extends beyond the tip of its dorsal spine whereas the first dorsal fin of *C. bahamaensis* does not extend beyond the tip of its dorsal spine. The ventral caudal margin in *C. bahamaensis* ends slightly posterior to the dorsal caudal margin whereas in *C. cubana* the ventral margin extends much farther posterior to dorsal margin. The preopercular and oral lateral line canals of the head in *C. cubana* do not share a common branch whereas in *C. bahamaensis* the preopercular and oral lat-

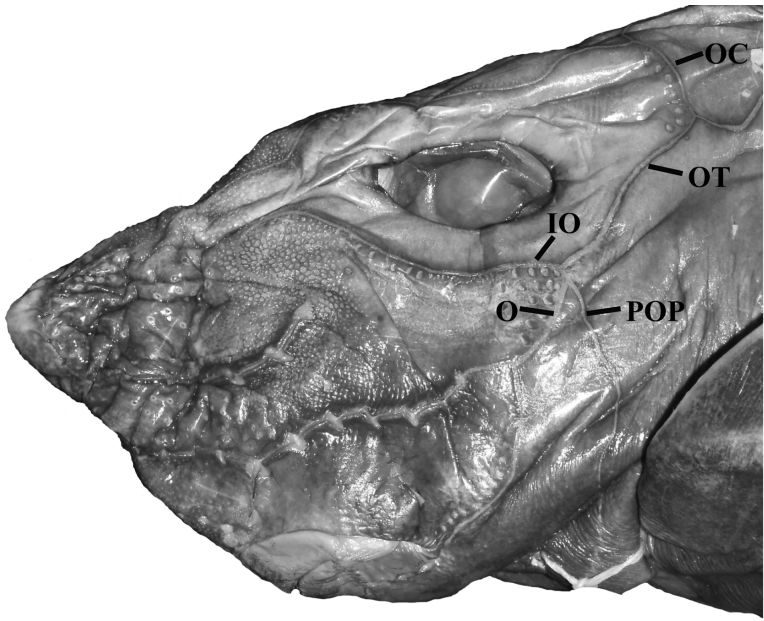


Figure 2. Lateral line canals of the head on preserved *Chimaera bahamaensis* sp. nov. holotype. The oral (O) and preopercular (POP) lateral line canals share a common branch off the infraorbital (IO) canal. The lateral line of the trunk branches from the junction of the otic (OT) and the occipital (OC) lateral line canals.

eral lines share a short common branch. *Chimaera bahamaensis* also differs from *C. cubana* in coloration being a solid caramel color with slightly darker fins compared with *C. cubana* which is a uniform silvery gray, lighter ventrally with all fins having a black distal margin (Howell-Rivero, 1936).

*Chimaera bahamaensis* differs from *C. monstrosa* in having a larger body (528 vs 400–488 mm BDL), a shorter snout-vent length (56.8% vs 59.0%–67.0% BDL), a shorter pre-second dorsal length (45.3% vs 46.0%–57.0% BDL), a longer pre-narial length (15.4% vs 6.0%–10.0% BDL), a longer second dorsal fin base (80.5% vs 71.0%–79.0% BDL), a greater second dorsal fin posterior height (5.4% vs 3.0%–4.0% BDL), a shorter first dorsal fin base (13.7% vs 14.0%–21.0% BDL), a shorter first dorsal fin height (14.4% vs 18.0%–24.0% BDL), a greater caudal dorsal fin lobe height (4.5% vs 2.0%–4.0% BDL) and ventral fin lobe height (4.4% vs 2.0%–4.0% BDL), a longer pectoral fin anterior margin (41.3% vs 29.0%–40.0% BDL), a longer pelvic fin anterior margin (22.5% vs 15.0%–21.0% BDL), a shorter pectoral-pelvic space (23.4% vs 30.0%–40.0% BDL), a longer pelvic-caudal space (63.8% vs 53.0%–60.0% BDL), and a smaller eye height (3.5% vs 5.0%–6.0% BDL). *Chimaera bahamaensis* has an anal fin tip that extends beyond the second dorsal fin insertion compared with *C. monstrosa* whose anal fin tip does not extend past the second dorsal fin insertion. In *C. monstrosa* the ventral caudal margin extends well beyond the dorsal caudal margin compared with *C. bahamaensis* whose ventral caudal margin extends only slightly posterior to the dorsal caudal margin. The distance from the anterior base of the spine to the center of the supratemporal canal (SPS) is shorter in *C. bahamaensis* (14.1% vs 16.1%–28.3% HDL). Coloration of *C. monstrosa* is a silvery body, mottled with brown spots and undulating stripes, creamy ventrally, fins grayish, and a black



margin on the distal edges of medial fins (Stehmann and Bürkel, 1984) compared with *C. bahamaensis* which is a solid caramel brown color.

*Chimaera bahamaensis* differs from *C. cf. monstrosa* in having a longer pre-caudal length (125.2% vs 116.7%–123.0% BDL), a longer pre-first dorsal fin length (26.5% vs 23.2%–26.1% BDL), a longer pre-orbital length (14.3% vs 10.3%–11.8% BDL), a longer pre-narial length (15.4% vs 7.5%–10.3% BDL), a longer second dorsal fin base (80.5% vs 73.8%–77.9% BDL), a longer dorsal spine anterior length (23.1% vs 15.9%–22.1% BDL), a longer head length (25.1% vs 20.7%–23.0% BDL), a longer pectoral fin anterior margin (41.3% vs 34.3%–38.9% BDL), a longer pelvic fin anterior margin (22.5% vs 17.6%–20.9% BDL), a shorter pectoral-pelvic space (23.4% vs 29.4%–35.2% BDL), a longer pelvic-caudal space (63.8% vs 56.4% BDL), and a deeper body with distance from anterior edge of first dorsal fin base to anterior edge of pectoral fin base 21.8% vs 12.8%–17.5% BDL. Pectoral fins of *C. bahamaensis* when depressed extend past pelvic fin insertion compared with *C. cf. monstrosa* whose pectorals fins reach only to pelvic fin origin. The lateral line canal of the trunk in *C. bahamaensis* is mainly undulating compared with *C. cf. monstrosa* whose lateral line is mostly straight. The coloration of *C. cf. monstrosa* is a uniform blackish brown with dark bluish streaking compared with *C. bahamaensis* which is a uniform caramel color, no patterns or streaking.

In addition, the known range of *C. cf. monstrosa* is the west and south coast of southern Africa (Compagno et al., 1989) making it unlikely that *C. cf. monstrosa* would be confused with *C. bahamaensis*. *Chimaera monstrosa* has a known distribution throughout the eastern North Atlantic (Bigelow and Schroeder, 1953; Stehmann and Bürkel, 1984; Møller et al., 2004), where it is common, and from off North Carolina in the western North Atlantic (Ross and Quattrini, 2007) making it more likely that *C. bahamaensis* may be confused for *C. monstrosa*. However, morphological differences (e.g., longer pre-narial length, greater second dorsal posterior height, greater caudal dorsal and ventral height, and longer pelvic-caudal space of *C. bahamaensis*) and coloration can easily distinguish the two species. *Chimaera cubana* occurs in the Caribbean Sea and may overlap with *C. bahamaensis* in its distribution, but the former is easily distinguished by its smaller body size, shorter caudal dorsal and ventral lobe height, greater caudal ventral margin, shorter pelvic fin anterior margin, preopercular and oral lateral lines branching separately from the infraorbital canal, and by coloration.

**Remarks.**—This study has determined that the specimen collected in Bahamian waters of the western North Atlantic is a new species in the genus *Chimaera*. *Chimaera bahamaensis* is now the fourth species in the genus *Chimaera* known to occur in the Atlantic Ocean. It is also the second chimaeroid species confirmed to occur around the Bahamas. *Hydrolagus alberti* Bigelow and Schroeder, 1951, is known to occur in Bahamian waters at similar depths to this new species and in the Caribbean Sea and Gulf of Mexico. Chimaeras of unidentified species have also been observed by ROV in Bahamian waters (D. Didier, pers. obs.).

**Comparative Material.**—*Chimaera monstrosa*. 23 specimens: USNM 17492, adult male, 800 mm TL, 400 mm BDL, Atlantic Ocean (Norway); MNHN 21–137, adult male, 919 mm TL, 419 mm BDL, Atlantic Ocean (Cotes d'Espagne); MNHN 3, adult male, 906 mm TL, 403 mm BDL, Atlantic Ocean (Scotland), 58°40'N, 9°30'W, 600 m; MNHN 13, adult male, 655 mm TL, 403 mm BDL, Atlantic Ocean (Scotland),

58°40'N, 9°30'W, 600 m; MNHN 14, adult male, 845 mm TL, 432 mm BDL, Atlantic Ocean (Scotland), 58°40'N, 9°30'W, 600 m; MNHN 16, adult male, 712 mm TL, 409 mm BDL, Atlantic Ocean (Scotland), 58°40'N, 9°30'W, 600 m; MNHN 17, adult male, 795 mm TL, 414 mm BDL, Atlantic Ocean (Scotland), 58°40'N, 9°30'W, 600 m; MNHN 18, adult male, 850 mm TL, 418 mm BDL, Atlantic Ocean (Scotland), 58°40'N, 9°30'W, 600 m; MNHN 19, adult male, 826 mm TL, 430 mm BDL, Atlantic Ocean (Scotland), 58°40'N, 9°30'W, 600 m; MNHN 20, adult male, 688 mm TL, 403 mm BDL, Atlantic Ocean (Scotland), 58°40'N, 9°30'W, 600 m; MNHN 24, adult male, 864 mm TL, 420 mm BDL, Atlantic Ocean (Scotland), 58°40'N, 9°30'W, 600 m; MCZ 326, adult female, 725 mm TL, 462 mm BDL, no data; MCZ 855, adult female, 774 mm TL, 449 mm BDL, Atlantic Ocean; USNM 10234, adult female, 708 mm TL, 453 mm BDL, Atlantic Ocean (Norway); MNHN 1, adult female, 834 mm TL, 485 mm BDL, Atlantic Ocean (Scotland), 58°40'N, 9°30'W, 600 m; MNHN 8, adult female, 817 mm TL, 423 mm BDL, Atlantic Ocean (Scotland), 58°40'N, 9°30'W, 600 m; MNHN 9, adult female, 916 mm TL, 488 mm BDL, Atlantic Ocean (Scotland), 58°40'N, 9°30'W, 600 m; MNHN 10, adult female, 902 mm TL, 421 mm BDL, Atlantic Ocean (Scotland), 58°40'N, 9°30'W, 600 m; MNHN 11, adult female, 980 mm TL, 469 mm BDL, Atlantic Ocean (Scotland), 58°40'N, 9°30'W, 600 m; MNHN 12, adult female, 895 mm TL, 430 mm BDL, Atlantic Ocean (Scotland), 58°40'N, 9°30'W, 600 m; MNHN 21, adult female, 830 mm TL, 408 mm BDL, Atlantic Ocean (Scotland), 58°40'N, 9°30'W, 600 m; MNHN 23, adult female, 830 mm TL, 427 mm BDL, Atlantic Ocean (Scotland), 58°40'N, 9°30'W, 600 m; LJVC-0459, adult female, 850 mm TL, 541 mm BDL. *Chimaera* cf. *monstrosa* five specimens: SAM 34517, adult male, 837 mm TL, 509 mm BDL, Cape Agulhas, southern Africa, 34°49'9"S, 20°00'0"E; SAM 34428, adult male, 820 mm TL, 486 mm BDL, southern Africa, 34°43'3"S, 18°03'6"E, 717 m; SAIAB 27132, adult female, 930 mm TL, 517 mm BDL, southern Africa, 32°30'5"S, 16°24'3"E, 800 m; SAIAB 27133, adult female, 925 mm TL, 522 mm BDL, southern Africa, 32°30'5"S, 16°24'3"E, 800 m; SAM 34429, adult female, 880 mm TL, 534 mm BDL, southern Africa, 34°55'6"S, 18°11'7"E, 903 m. *Chimaera cubana*. 13 specimens: MCZ 1464, holotype, adult male, 728 mm TL, 427 mm BDL, Cuba, Matanzas Bay; FMNH 71595, female, 283 mm TL, 118.3 mm BDL, Puerto Rico, 18°16'N, 67°16.5'W; USNM 222711, female, 429 mm TL, 211 mm BDL, Caribbean Sea, 16°45'N, 81°27'W, 0–150fms; USNM 222800, female, 300 mm TL, 115.4 mm BDL, Caribbean Sea, 15°38'N, 61°51'W, 0–245fms; USNM 222800, female, 406 mm TL, 171 mm BDL, Caribbean Sea, 15°38'N, 61°15'W, 0–245fms; MCZ 1385, male, 664 mm TL, 319 mm BDL, Cuba; MCZ 40682, male, 277 mm TL, 110.6 mm BDL, Caribbean Sea, 18°16'N, 67°17'W, 250fms; MCZ 40682, male, 258 mm TL, 116.1 mm BDL, Caribbean Sea, 18°16'N, 67°17'W, 250fms; USNM 222796, male, 549 mm TL, 241 mm BDL, Western Atlantic; USNM 222800, male, 267 mm TL, 129.1 mm BDL, L. Antilles, 15°38'N, 61°15'W, 0–245fms; USNM 222800, male, 368 mm TL, 164 mm BDL, L. Antilles, 15°38'N, 61°15'W, 0–245fms; USNM 222800, male, 215 mm TL, 109 mm BDL, L. Antilles, 15°38'N, 61°15'W, 0–245fms; USNM 372728, juvenile male, 685 mm TL, 343 mm BDL, Puerto Rico, La Parguera, 180m.

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## LITERATURE CITED

- Bigelow, H. B. and W. C. Schroeder. 1951. Three new skates and a new chimaerid fish from the Gulf of Mexico. *J. Wash. Acad. Sci.* 41: 383–392.
- and ———. 1953. Chimaeroids Pages 515–562 in J. Tee-van, C. M. Breder, A. E. Parr, W. C. Schroeder, and L. P. Schultz, eds. *Fishes of the western north Atlantic part two. Sawfishes, guitarfishes, skates and rays.* Sears Foundation for Marine Research, Yale University, New Haven.
- Compagno, L. J. V., D. A. Ebert, and M. J. Smale. 1989. *Guide to sharks and rays of southern Africa.* New Holland, London. 160 p.
- Didier, D. A. 2004. Phylogeny and classification of extant holocephali Pages 115–135 in J. C. Carrier, J. A. Musick, and M. R. Heithaus, eds. *Biology of sharks and their relatives.* CRC Press, Boca Raton.
- and B. Séret. 2002. Chimaeroid fishes of New Caledonia with description of a new species of *Hydrolagus* (Chondrichthyes, Holocephali). *Cybium* 26: 225–233.
- and M. Stehmann. 1996. *Neoharriotta pumila*, a new species of longnose chimaera from the northwestern Indian Ocean (Pisces, Holocephali, Rhinochimaeridae). *Copeia* 1996: 955–965.
- Eschmeyer, W. N. and R. Fricke (eds.) *Catalog of fishes electronic version* [updated 2 July 2009, cited 9 September 2009]. Available from: <http://research.calacademy.org/ichthyology/catalog/fishcatserach.html>
- Howell Rivero, L. 1936. Some new, rare and little known fishes from Cuba. *Proc. Bost. Soc. Nat. Hist.* 41: 41–56.
- James, K. C., D. A. Ebert, D. J. Long, and D. A. Didier. 2009. A new species of chimaera, *Hydrolagus melanophasma* sp. nov. (Chondrichthyes: Chimaeriformes: Chimaeridae), from the Eastern North Pacific. *Zootaxa* 2218: 59–68.
- Leviton, A. E., R. H. Gibbs Jr., E. Heal, and C. E. Dawson. 1985. Standards in herpetology and ichthyology: Part I. Standard symbolic codes for institutional resource collections in herpetology and ichthyology. *Copeia* 1985: 802–832.
- Linnaeus, C. 1758. *Systema Naturae* Ed X (*Systema natura per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis.* Tomus I. Editio decimal, reformata.) Holmiae 824 p.
- Møller, P. R., T. Kullberg, and O. A. Jørgensen. 2004. New records of chimaeroid fishes from Greenland waters (North Atlantic), with description of juvenile *Chimaera monstrosa* and *Hydrolagus affinis* (Holocephali, Chimaeridae). *Cybium* 28: 55–60.
- Quaranta, K. L., D. A. Didier, D. J. Long, and D. A. Ebert. 2006. A new species of chimaeroid, *Hydrolagus alphas* sp. nov. (Chimaeriformes: Chimaeridae) from the Galapagos Islands. *Zootaxa* 1377: 33–45.
- Ross, S. W. and A. M. Quattrini. 2007. The fish fauna associated with deep coral banks off the southeastern United States. *Deep-Sea Res Pt 1* 54: 975–1007.
- Stehmann, M. and D. L. Bürkel. 1984. Rajidae Pages 163–196 in P. J. P. Whitehead, M. L. Bauchot, J. C. Hureau, J. Nielsen, and E. Tortonese, eds. *Fishes of the northeastern Atlantic and the Mediterranean.* UNESCO, Paris.

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ADDRESSES: (J.M.K.) *Pacific Shark Research Center, Moss Landing Marine Laboratories, 8272 Moss Landing Road, Moss Landing, California 95039.* (D.A.E.) *Pacific Shark Research Center, Moss Landing Marine Laboratories, 8272 Moss Landing Road, Moss Landing, California 95039 and South African Institute for Aquatic Biodiversity, Private Bag 1015, Grahamstown, 6140, South Africa.* (D.A.D.) *Department of Biology, Millersville University, P.O. Box 1002, Millersville, Pennsylvania 17551.* (L.J.V.C.) *Shark Research Center, Iziko – South African Museum, Cape Town, South Africa.* CORRESPONDING AUTHOR: (J.M.K.) *E-mail: <jkemper@mlml.calstate.edu>.*



## APPENDIX

*List of Morphometric and Lateral Line Canal Abbreviations Used in Tables*

Total length (TL); precaudal length (PCL); body length (BDL); snout-vent length (SVL); trunk length (TRL); pre-second dorsal length (PD2); pre-first dorsal length (PD1); pre-orbital length (POB); pre-oral length (POR); pre-narial length (PRN); second dorsal fin base (D2B); maximum height of anterior second dorsal fin (D2AH); maximum height of posterior second dorsal fin (D2PH); first dorsal fin base (D1B); dorsal spine length (DSA); maximum height of first dorsal fin (D1H); dorsal caudal margin (CDM); maximum height of dorsal caudal fin (CDH); total caudal fin length including filament (CTL); ventral caudal margin (CVM); maximum height of ventral caudal fin (CVH); head length (HDL); anterior margin of pectoral fin (P1A); anterior margin of pelvic fin (P2A); interdorsal space (IDS); dorsal-caudal space (DCS); posterior base of pectoral fin to anterior base of pelvic fin (PPS); posterior base of pelvic fin to origin of anal fin (PAS); posterior base of pelvic fin to origin of ventral caudal fin lobe (PCS); anterior edge of first dorsal fin base to anterior edge of pectoral fin base (D1P1); anterior edge of first dorsal fin base to anterior edge of pelvic fin base (D1P2); anterior edge of second dorsal fin base to anterior edge of pectoral fin base (D2P1); anterior edge of second dorsal fin base to anterior edge of pelvic fin base (D2P2); eye length (EYL); eye height (EYH); distance from anterior oronasal fold to center of nasal canal (ONC); length of the rostral canal (LRC); length of the nasal canal measured as the straight line distance from right to left side (LNC); distance between infraorbital and angular canal measured as the straight line distance from junction of the oral and infraorbital canal to the junction of the oral and angular canal (IOA); distance between preopercular canal and main trunk canal measured from their junction with the infraorbital canal (OTM); distance between the main trunk canal and supratemporal canal measured from their junctions with the infraorbital and postorbital canals (OCL); length of supratemporal canal measured across the head from its junctions with the postorbital canal (STL); distance from anterior base of spine to the center of the supratemporal canal (SPS).